

THE METAL INDUSTRY

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TRADE JOURNAL

ALUMINUM

RELATING TO THE NON-FERROUS METALS

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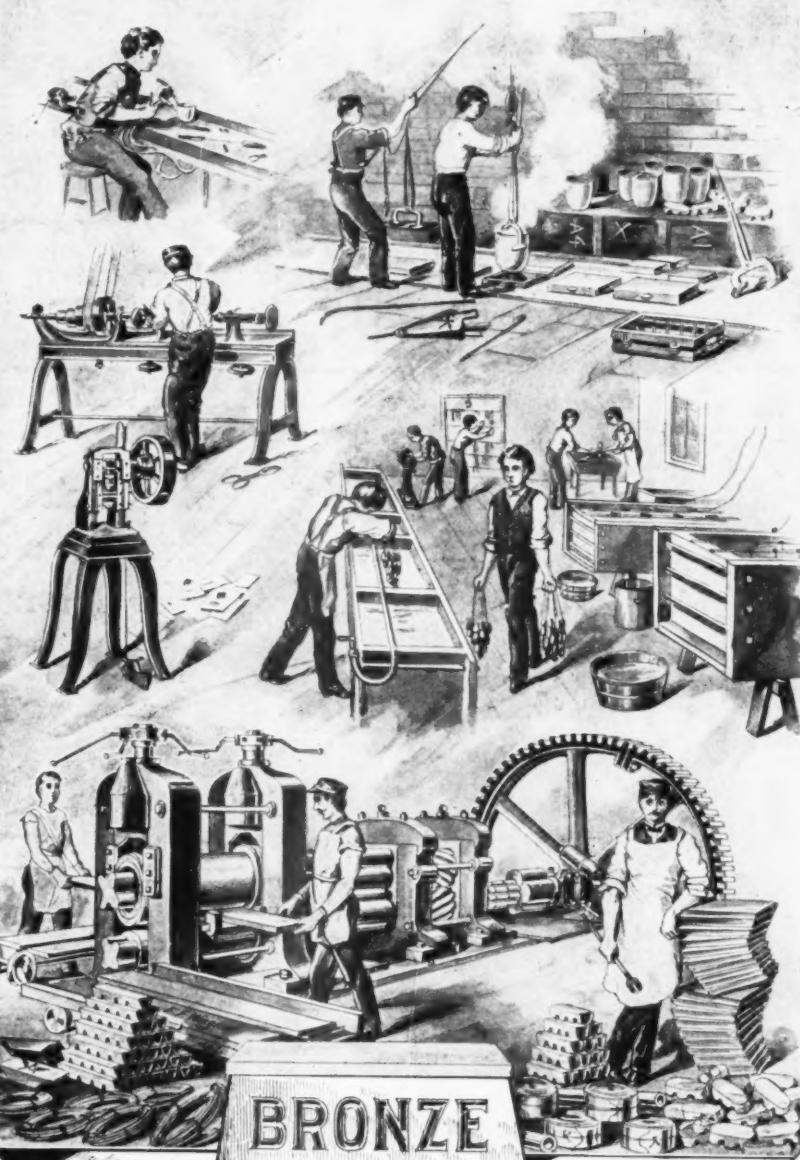
SILVER

GOLD

TIN

LEAD

ZINC



OLD SERIES
Vol. X, No. 8.
Vol. II, No. 8.
NEW SERIES

BRONZE

LA BOR OMNIA
AUGUST, 1904
VINCIT

NEW YORK.

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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
AND ELECTRO-PLATERS REVIEW.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

OLD SERIES
VOL. X., NO. 8.

NEW YORK, AUGUST, 1904

NEW SERIES
VOL. II., NO. 8.

THE ABUSE OF PHOSPHORUS.

Metallurgically, phosphorus is a good servant but a bad master. We regret to say, however, that, even at this late day, the true function of phosphorus in alloys is not generally understood. By many it is considered only as an ingredient of the alloy, and is added in large amounts in the same manner that tin or zinc is introduced. Those who do this finally wonder why their phosphor-bronze is not as satisfactory as standard brands.

The real agency of phosphorus in alloys is the reduction of the oxide of copper or tin, which is always formed when these metals are melted, and it is not intended as an ingredient of the alloy. Up to a certain amount, phosphorus is a benefit in various alloys, but beyond acts as a positive injury. This will be readily seen when one stops to consider that phosphorus is not a metal at all, but is a brittle, non-metallic substance which possesses no strength or ductility. The amount necessary in phosphor bronze is a quantity just sufficient to reduce the oxides present, and such an amount is rarely over 0.05 per cent. The ideal alloy of this nature is one in which there has been just enough phosphorus added to deoxidize the alloy, but no more. An excess or increase over the deoxidizing amount acts prejudicially.

We occasionally see mixtures given which contain as high as 2 per cent of phosphorus, and we only ask that these be tried in order to prove the wisdom of our remarks. Contrary to the usual belief, the amount of phosphorus should decrease rather than increase as the proportion of tin is increased. Leaving out the question of the use of scrap, it will be found that for rolling mill work—i. e., plates, bars, or rods cast in metal molds—that 0.05 per cent. of phosphorus is the proper amount, and under no consideration should more be added. It is often believed that an alloy can be hardened by phosphorus, and indeed it can, but the alloy will not roll. In all alloys intended for rolling the percentage of phosphorus must be kept the same, and if hardness is desired it may be obtained by increasing the tin.

For sand castings it will be advisable to use more phosphorus than that employed for rolling mill work. This is on account of the use of so much scrap, the phosphorus of which is oxidized out by repeated meltings. In order to allow for such oxidation the excess

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of phosphorus is introduced. Were nothing but new metal used the amount of phosphorus given before (0.05 per cent.) would be ample, and if castings of the soundest nature and highest tensile strength and ductility are desired this amount must be kept uniform. If the usual run of sand casting work is made and the material in the form of gates, risers, bad castings, etc., is repeatedly melted, then an amount of phosphorus equivalent to 0.25 per cent. should be introduced. In connection with the large amount of phosphorus which is often recommended in alloys for sand castings, we would say that in every case we have found that blowholes were present in the casting.

In conclusion, we desire to criticise the user of phosphor bronze in a small way who persists in making his alloys from stick phosphorus. No more dangerous substance ever enters the brass foundry, and in addition the resulting alloy is never uniform. The phosphorus only enters the alloy in a small amount, and the balance is wasted. If absolute uniformity is desired, and with no danger, the use of phosphor-tin or phosphor-copper for introducing the phosphorus is to be recommended. The phosphorus may then be added to the alloy in absolute amounts and without the uncertainty which follows the use of stick phosphorus. In the small way in which phosphor alloys are used in some foundries, the latter practice certainly shows no economy, and is surrounded with much danger.

SHEET NICKEL ANODES.

Inasmuch as there are upwards of ten thousand companies and individuals in the United States alone who do nickel-plating, the subject of anodes is of vital importance. We have called attention, at a previous time, to the quality of the nickel anodes which are sold on the market, and in return our own attention has been directed by the anode makers to the necessity of having some alloy present with the nickel in order to obtain the necessary results. One anode maker habitually introduces four per cent. of tin (in addition to iron) in his anodes. Another uses old files as the alloy, and claims that the carbon introduced thereby is quite beneficial.

Although in every other case rolled anodes are used in the electro-plating industry, gold, silver, copper, brass, bronze, etc., in the nickel industry it is claimed that rolled anodes will not do the work as well as the cast and impure article. Many have presumed that it is impossible to obtain sheet nickel in a pure state, and hence cast anodes must be used. Rolled nickel is now an article of commerce, but as regards its value as an anode in the nickel-plating process there seems to be much difference of opinion. Articles which have recently appeared giving the results of tests indicate the inferiority of the rolled article when compared with the cast. On the other hand, advices recently received from experienced platers show that the rolled article would be used if it could be advantageously obtained. The latter say that the best re-

sults ever obtained were those obtained with the rolled and, consequently, pure article. The opinions and experiences on this question appear to be so contradictory that we ask for further expressions of opinion and results obtained along this line, and will gladly publish any communications bearing upon the subject.

THE SAND BLAST.

From an appliance possessed by only a few concerns and obtained from other countries, the sand blast has become a fixture and an invaluable feature of the metal working industry. New uses are found for it every day, and the majority prove to be valuable. For cleaning of castings and imparting to them a matt finish the sand blast is excellent. For obtaining a surface upon which tinning or galvanizing is to be done, it is unequalled, as the scoured and slightly rough result which is obtained enables these metals to cling with great tenacity. All nickel anodes are scoured by means of the sand blast, which not only cleans them, but imparts to them a surface which allows the solution to act evenly and without the danger of polarization which is apt to occur on a smooth surfaced anode.

The past year has witnessed many new forms of sand blast placed upon the market and in an improved and inexpensive form. Many of them are continuous and free from the disagreeable features of the earlier forms of the appliance. Instead of an appliance only made abroad, the sand blast may now be obtained from many makers in our own country and at a price within the reach of all.

THE LEAD COMBINATION.

The long proposed combination of lead interests seems to be near the point of culmination. It is expected that the deal will be made as we go to press. The entire field will then be controlled, and the lead consumer will undoubtedly fail to profit thereby.

In January, 1903, a merger of nearly all the lead companies in the United States was affected under the name of the United Lead Company, and, it is understood this company now controls about three-quarters of the lead production in the country. The balance is controlled by the National Lead Company, and with whom the United Lead Company is endeavoring to effect a combination. The proposed combination will be one of combinations and not of individual interests.

We understand that proposals have been made to nearly all the small independent lead pipe and sheet producers (of which there are many in the United States) to sell to the combination, and they have been asked to put a price upon their plant. It would appear from such a condition that the new combination proposes to make a clean sweep of all the lead workers in the land.

A NEW PROCESS FOR GALVANIZING.

By Sherard Cowper-Coles.*

Zinc has proved the most effective coating for iron and steel, and hot-galvanizing, with all its attendant advantages, is the process most extensively used for applying zinc to metal surfaces. Electro-zincing or cold galvanizing is used for special classes of work and is

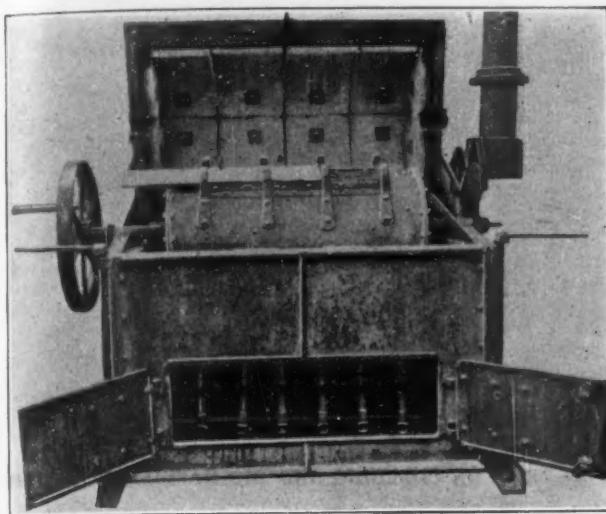


FIG. 1.—GAS FURNACE FOR SHERARDIZING SMALL ARTICLES.

extensively used by the Admiralty for giving boiler tubes a thin flashing of zinc for the purpose of detecting flaws and protecting the tubes from corrosion during the time of assembling and erection. Works have just been completed for a new process to which the name of "Sherardizing" has been given. One point of particular interest about the new process is that iron and steel can be coated with an even deposit of zinc at a temperature several hundred degrees below the melting point of zinc.

The first step in the process is to free the iron from scale and oxide by any of the well-known methods, such as dipping in an acid solution or sand blasting. The articles to be rendered rustless are then placed in a closed iron receptacle, charged with zinc dust, which is heated to a temperature of from 500 to 600 degrees Fahrenheit for a few hours and allowed to cool; the drum is then opened and the iron articles removed when they are found to be coated with a fine, homogenous coating of zinc, the thickness depending upon the temperature and the length of time. It will be observed that the temperature required to bring about this result is about 200 degrees Fahrenheit below the melting-point of zinc. The low temperature required makes the process cheap as compared with the process of dipping in molten zinc, and the additional advantage that it does not deteriorate iron or steel of small section to the same extent as hot galvanizing. The whole of the zinc dust is consumed; there is no waste of zinc as in the hot galvanizing process. This new process of galvanizing is not limited to the coating of iron with zinc, it has been successfully applied to coating iron with copper, aluminum, or antimony. It has also been applied to coating various other metals. For instance, aluminum and copper with zinc. Copper and its alloys subjected to this process are case-hardened on the surface and can be rendered so hard as to turn the edge of a steel tool.

The zinc powder used in the process is the zinc dust of commerce and must not be confused with zinc oxide; it is

obtained during the process of distilling zinc from its ores. Zinc dust at the present time is used for a variety of purposes, and can be obtained in any desired quantity. The price of zinc dust is usually below that of plate spelter. The receptacle in which the zinc dust is placed and heated is preferably air-tight and the air exhausted so as to prevent the formation of too much zinc oxide; or, if this is not feasible, it is advisable to add about 3 per cent. of carbon in a very fine state of division. If the percentage of oxide is allowed to increase beyond certain limits it is found that the deposit will become dull in appearance instead of having a bright metallic lustre, although good deposits of zinc can be obtained from the zinc dust varying considerably in composition. To prevent the iron receptacle in which the process of "Sherardizing" is carried on from becoming coated with zinc, it is found advantageous to coat the inside of the drum with plumbago or black-lead. Articles coated with grease receive as good if not a better coating of zinc than those which are free from it. This fact is of considerable importance as it enables considerable machine work such as bolts, nuts, and screws, etc., to be thrown direct after machining into the "Sherardizing" drum without any preparation or cleaning. The articles when they have been heated in the zinc dust for the period necessary to obtain the thickness of zinc required, can be removed whilst the zinc dust is still hot, although the better practice is to allow the zinc dust to cool to a temperature at which the articles can be readily handled, as the deposit of zinc is whiter and less oxide of zinc is formed. The new process of dry galvanizing offers many facilities and great economy to those manufacturers who have not sufficient work to keep a large bath of molten zinc continuously at work. Articles can be "Sherardized" on a few hours' notice, starting all cold, as the drums can readily be heated by gas or coke furnace, the whole operation occupying

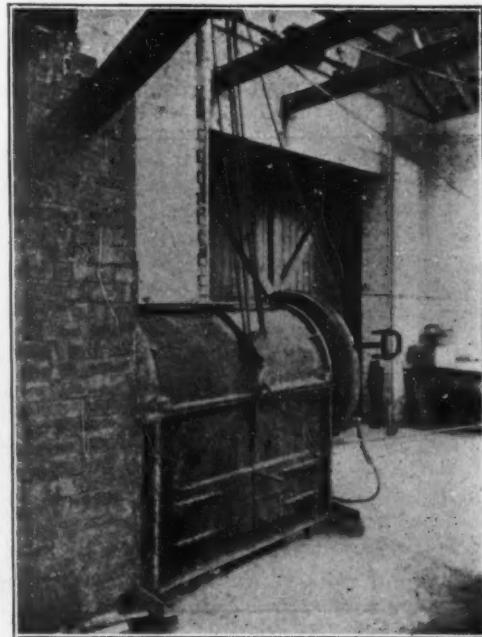


FIG. 2.—DRUM.

only a few hours. When the plant is not working there is no waste as in the case of hot galvanizing, when the zinc has to be kept in a molten condition day and night.

Fig. 1 shows a furnace suitable for galvanizing or "Sherardizing" one or two hundredweight of small articles at

a time; one of the trunnions is made hollow so that a pyrometer can be inserted. Below the furnace is arranged a number of Bunsen gas burners for heating the drum, and the whole is enclosed in a cast iron shell lined with fire-brick. The drum can be rotated either by hand intermittently or continuously by means of a suitable gearing D, as shown in Fig. 2, which illustrates a similar construction of drums. The furnaces are heated by gas; the gas is lead by iron pipes to the back of the furnaces, the supply of gas being controlled by iron cocks. The gas is then conducted through brick channels through which the air is drawn.

The charging of the drum is effected by running the truck on which the drum is placed on to a table, one end of which is lowered by means of gearing so as to tilt the other end into which the zinc dust is charged from an upper floor by means of a chute, as shown in Fig. 4, which illustrates the drum being discharged over an iron grating which allows the zinc to fall into a chamber below, from which it is raised by means of chain elevator to the floor above. When the drum is charged with zinc dust and the articles to be galvanized, it is brought into a horizontal position, the air is exhausted, and the truck is run along the line until it arrives in front of the furnaces. It is then lifted on to a furnace truck (Fig. 3), the object being to effect the saving of the first cost of the furnace and to save waste of heat. The drum is then pushed into the furnace, the door lowered, and the furnace heated up to the desired temperature. The heat is regulated in accordance with the readings of a thermometer which is placed in a vertical iron tube inside the furnace. When the drum has been in the furnace a sufficient time to give the desired result, the door is then raised and the drum and carriage withdrawn; the drum is lifted on to another carriage and run out into an open yard, where it is allowed to cool down to a temperature low enough to admit of handling.

Comparison of surfaces obtained by hot and cold galvanizing and "Sherardizing" is different in each case, but they can be readily distinguished by anybody conversant with the three processes. In the case of hot galvanizing the surface is spangled, or has the appearance of cast metal. In the case of cold galvanizing, the surface is free from spangles and has a matt or frosted surface, uniform

the case with the hot and cold galvanizing processes. The "Sherardizing" process, although similar to cold galvanizing, in some respects, is also similar to hot galvanizing in other respects, inasmuch as the zinc alloys with the iron and forms a protective zinc-iron alloy intermediate between a zinc coating and the underlying metals.

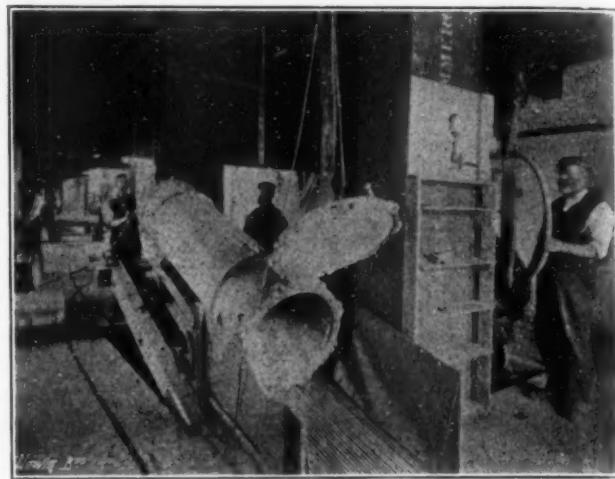


FIG. 4.—DRUM ON CHARGING AND DISCHARGING PLATFORMS.

As "Sherardizing" is effected at a very much lower temperature than hot galvanizing, the temper of steel wires is not reduced as it is in the latter process. The number of steel and iron bolts "Sherardized" at varying temperatures when tested for tensile strength were found to be equal in strength to bolts which had not been treated.

The dry process of galvanizing is cheaper than hot-galvanizing for the following reasons:

1. Less zinc is required to give the same protective coating, as the zinc is evenly distributed.
2. The temperature required is low.
3. The labor is less, as the articles do not require to be cleaned as carefully as in hot-galvanizing.
4. No flux is required, no dross or skimmings are formed.
5. There is no danger of explosion or breaking of castings and distorting of thin iron work.
6. Sherardizing machine work does not require re-fitting, as the coating is evenly distributed.
7. There is no reduction in tensile strength as in the case of hot-galvanizing.
8. The coating is more uniform and even than that obtained by hot or cold galvanizing.
9. The work can be placed direct in the "Sherardizing" drum from the pickling vat without drying.
10. The process can be worked intermittently without waste.
11. Iron can be coated with zinc to any desired thickness.

Another advantage of "Sherardizing," provided sufficient time is given for coating, is that it has the effect of bringing the surface into a more uniform state of tension. The cost of the plant for "Sherardizing" is very much cheaper than a plant of equal capacity for hot or cold galvanizing.

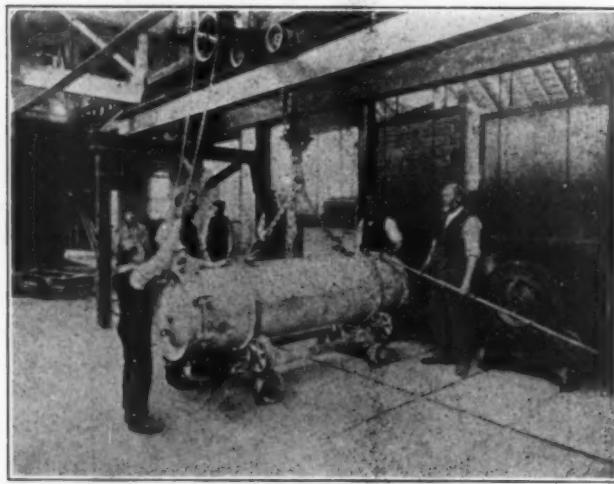


FIG. 3.—DRUM ON FURNACE TRUCK.

if the work has been well executed. Sherardizing is again distinctive from the two former processes; the general appearance resembles more that of cold galvanizing than hot galvanizing, but is more lustrous and metallic and is uniformly distributed over the whole surface, which is not

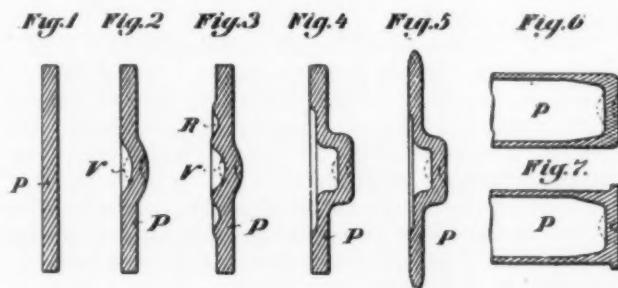
We have received from the United States Bureau of Insular Affairs a book describing the Philippine Government Exposition at the St. Louis Fair. It is the largest single exhibit at the exposition.

A NEW METHOD OF MAKING CARTRIDGE SHELLS

The usual method of making cartridge shells is by means of sheet metal and the press. The shell is drawn up by successive operations and with different shaped dies. During the process the metal is annealed when it becomes too hard to withstand any additional drawing. Such a process, while universally used, leaves something to be desired. The fibres of the metal are elongated in the wrong direction and the results obtained are analogous to those produced in the formation of a seamless brass tube by the usual method of cold drawing. The fibres of the metal are all extended longitudinally.

A new method of making cartridge shells has been invented by Eugen Polte, of Magdeburg-Sudenburg, Germany, which differs radically from the present method. It is said to give results which are better than the usual method of making shells and to compare favorably with the Mannessman or Stiefel processes for making seamless brass or copper tube. In the latter processes the fibres of the metal are forced into a tube or shell in a spiral direction so that it is better calculated to withstand the bursting pressure. Somewhat analogous are the superior advantages of the hydraulic forging over those produced by the steam hammer. In the former, the metal is gradually forced into shape without shock or tendency to overstrain it. The steam hammer, however, continually manifests a tendency to rupture the fibres and only work the outside of the material being operated upon. The Polte process of making shells may be favorably compared with the hydraulic forging or Mannessman process of making tubes as the metal fibres are elongated in the proper direction.

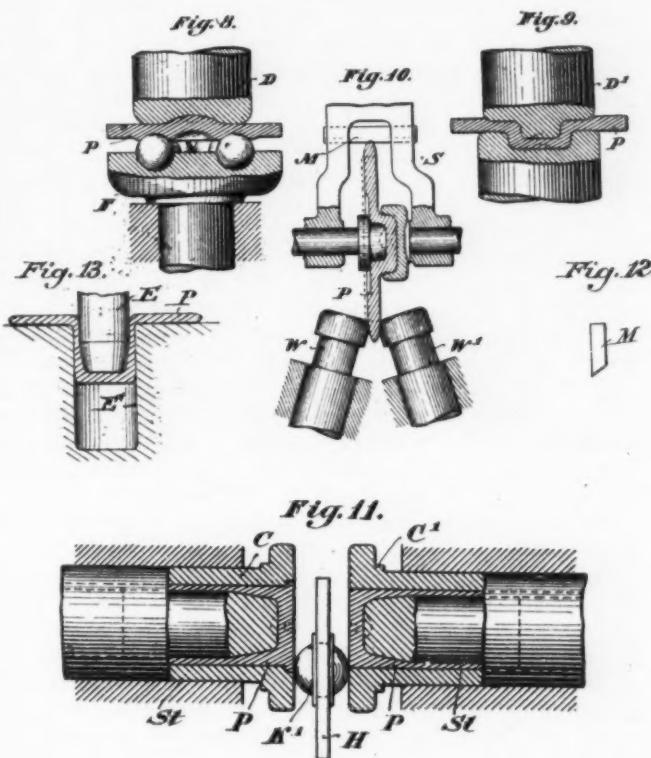
The process is particularly applicable to the formation of shells of large size, as these are the ones which require the utmost strength in the metal. Of course other forms than cartridge shells may be made, but these articles are more improved by the use of such a process than those which are not subject to so rigid requirements.



The process may best be illustrated by reference to the cuts. In Figs. 1 to 7, inclusive, the successive transformation of the metal disc into the finished cartridge shell is shown. Brass sheet is first cut into a circle of suitable thickness, as shown in Fig. 1. This circle may be produced by punch and die, or in any suitable manner. The depression *V* in Fig. 2 is next made by a punch and die and the disc placed in an apparatus indicated in Fig. 8. The disc is rotated until the shape shown in Fig. 3 is produced. In the tool, Fig. 8, one part *D*, remains stationary while the other revolves. Steel balls are used in the runway to form the groove.

By means of a punch and die, shown in Fig. 9, the disc is brought to the state indicated by Fig. 4. The disc is now transferred to a mechanism, shown in Fig. 10. The frame *S*, is made to move backwards or forwards from the two rollers, *W* and *W'*, and the disc is revolved. The shape now produced is that of Fig. 5, and in this process the fibres of the metal are made to lie concentric with the axis of the shell and rolled to any thickness desired. The

knife edge *M*, placed in the frame *S*, shears off the edge from the constantly widened disc, so that when this particular operation is completed the disc is of uniform diameter. The disc is now transferred to the press indicated in Fig. 13 and drawn into the shape of Fig. 6. The shells are now transferred to an apparatus shown in Fig. 11,



and by means of the steel ball again rotated and brought into the form of finished cartridge shells. In this apparatus the cylinders *C* and *C'*, are rotated in opposite directions at equal speeds. The ball *K'* therefore revolves, and at the same time the holder *H* is given a transverse motion which completes the shell.

Cartridge shells made by this method are said to stand the firing test far more satisfactorily than those made by the usual method on account of the arrangement of the fibres being such as to resist the pressure to a greater degree. In connection with this process of manufacturing cartridge shells it may be said that the largest single consumption of brass sheet is in the manufacture of this commodity.

A large testing machine has recently been installed at the Conservatoire des Arts et Métiers in Paris. The machine is capable of taking specimens up to 90 feet long and of cross section of 3 by 3 feet. At the official trial recently, a steel bar measuring 4 inches by 1 1/2 inches was pulled apart and broke at 528,000 pounds. The report does not tell the actual capacity of the machine in pounds, but from the foregoing information, however, it would be inferred that the machine is of somewhat less capacity than the one possessed by the United States Government at the Watertown Arsenal. This machine has a capacity of 1,000,000 pounds.

The Chicago Brass Manufacturers' Association have adopted a declaration of principles governing their relation with their employees.

HARD DRAWN COPPER WIRE.*

By Francis W. Jones.

The great strength which is obtained in hard drawn copper wire (of over 60,000 lbs. breaking strain to the square inch, which is very close to ordinary iron), with over six times better electrical conductivity than iron, with its almost complete immunity from oxidation and corrosion, ensuring a negligible depreciation, and its small electromagnetic inertia as compared with iron, are qualities which have made the use of copper wire very important to telegraph and telephone companies, and to meet the necessity of systems of communication requiring more rapid signals than Morse, the value of copper wire to telegraph companies for overhead construction will be still very greatly enhanced. But the full value of such wire, particularly its mechanical qualities, can only be secured by its most intelligent and careful construction and maintenance, from the fact that the strength of the wire lies entirely upon its surface, and that to secure the utmost tensile strength the wire has to be tempered to the verge of brittleness.

When telegraph wires were first strung upon poles, the length of the spans, the distance of wires apart, and the sags given, were decided purely by mechanical and financial considerations. The length of span having been fixed to require as few poles per mile as possible, the sag was restricted to such a distance that the wires would not swing together in the wind.

Modern construction has been determined largely by the same consideration.

An exception was made by the American Rapid Telegraph Company and the original Postal Telegraph Company, several years ago, in placing their wires farther apart to obviate the effects of electrostatic lateral induction, but on the discontinuance of the rapid systems then used by these companies, the intermediate space on the cross arms was used for other wires, and within recent years the tendency has been to place the wires still closer together, and this has become possible by reason of the shortening of the spans by a greater number of poles necessary to support the increasing load of wires.

Notice was early taken by engineers of the temperature effect upon wires, as it was found that when they were put up in a high temperature, with but little sag, that they would snap during cold weather, so the engineers furnished formula according to which sags should be given to wires of different lengths of span when erected at various degrees of temperature.

It is shown by Mr. John Gavey, the engineer-in-chief of the British Postal Telegraphs, page 336, vol. xxxi. of the Journal of the Institution of Electrical Engineers, London, that a hard drawn copper wire, when under a very light stress, acquires a permanent set if the stress be maintained sufficiently long, and that a wire nearly No. 12 B. & S., with a breaking strain of 490 pounds, loaded with 110 pounds, recovered its original length upon removal of the load if it was not continued too long, but if the load was kept on for twenty-four hours a permanent elongation of one sixty-fourth of an inch was produced in a length of about forty feet and that this elongation was a function of the time the load was kept on, increasing to one thirty-second of an inch in three days and three sixtieth-fourths of an inch in two weeks.

It is shown that hard drawn copper wire will not respond to its natural elasticity after being loaded for a few hours, and that the elasticity has been killed, so to speak, or the wire fatigued and its natural elasticity disappears.

I erected on May 7 last a new No. 9 B. & S. hard drawn copper wire, between fixed supports, 124 feet 1 inch apart,

with a sag of four inches, which equalled a horizontal stress of about 231 pounds, or roughly one-third of the breaking strain of the wire. The temperature at that time was sixty-five degrees Fahrenheit. On July 10, temperature 102 degrees Fahrenheit, the sag was eleven and one-eighth inches, and later in the day, at 93 degrees Fahrenheit, the sag was nine and three-eighths inches. On August 6, at a temperature of 65 degrees Fahrenheit, the same as when the wire was erected, it showed a sag of nine inches, or five inches in excess of the sag that was given it when first put up.

A new hard drawn copper wire has a natural elasticity which permits it to elongate a very trifling amount (about one-tenth of one per cent.) when under not exceeding two-thirds of its normal breaking strain for a short period of time, but when the strain upon the wire, or the period of time increases, then the wire permanently elongates.

When a short piece of the wire has been placed under stress to the limit of its breaking strain, of about 670 pounds, for a No. 9 B. & S. gauge, it breaks, and the two pieces measured will be found to have sustained a permanent elongation which, according to the temper of the wire, generally ranges between one and two per cent., and a piece of the wire, 150 feet long, when subjected to a strain of 670 pounds, at the same rate of elongation, would stretch from eighteen to thirty-six inches before breaking.

If such an elongation were possible to take place between telegraph poles, it would allow the wire a sag of nine feet or over.

Hard drawn copper may be permanently elongated nearly up to its maximum limit of elongation, and it will require as much strain to break such a piece of permanently elongated wire as if it had never been stretched.

What actually happens therefore seems to be this: Suppose a wire, when new, is given a sag of nearly seven and three-quarters inches, between poles 150 feet apart, at 80 degrees Fahrenheit, the wire then has a stress of about one-quarter of its breaking strain and the length of the wire is 150.0072 feet.

Should the temperature fall sufficiently, this wire will contract so that it will be subjected to a very heavy strain which will cause it to elongate unless the wire contains weak spots or kinks or places that have been slightly abraded or indented at the tie wires, in which case the wire will break at such weak points.

When this is the case the weak spots in the wire will, of course, prevent it from becoming permanently elongated beyond what it naturally elongates upon the poles as demonstrated by Mr. Gavey.

Should the wire have no unusually weak spots it will elongate sufficiently to prevent the stress in the wire raising to its breaking point.

It is evident that if linemen were to adopt the practice of taking up the sags by cutting out pieces of wire, that the time would soon arrive when the wire had stretched to the limits of its natural elongation and would break under the first stress imposed by low temperature or other cause.

A Pittsburg metal dealer recently received a shipment of 15,000 pounds of copper coins from Corea. The coins were in a mutilated condition and said to be upwards of 2,000 years old. The price paid is said to be 14 cents per pound. One would infer that the coin collector is to be sought if this price was actually paid.

About January 1, 1905, it is proposed to have at Vienna, Austria, a supplementary exhibit of some of the American machinery shown at the St. Louis Fair.

*Abstract from *Telegraph Age*.

THE PICH BRAZING PROCESS.

This process is the invention of Friedrich Pich, of Berlin, Germany, and is applied to the brazing of cast iron, a material which has hitherto resisted any attempts in this direction. To be sure, cast iron may be brazed by the regular process, but the joint is not sound and will not stand any strain. By the Pich process, however, a joint which is stronger than the cast iron itself may be made. Examples of this process were recently seen and consisted of the teeth of cast iron gears brazed on to the base. After brazing the teeth were hit by blows from a sledge hammer, but the breakage occurred outside of the brazed joint. Mill managers know how readily a mill may be put out of operation by the breaking of a gear tooth; indeed, a well-known mill in the brass region was recently forced to suspend operations for two months on account of the breakage of a tooth on the bull gear which drove the rolling mill. Some one had dropped a monkey wrench between the pinion and the gear.

The principle of the Pich brazing process consists in the reduction of the carbon on the surface of cast iron by means of oxide of copper. The metallic copper which is thereby reduced adheres tenaciously to the iron and the brazing solder likewise to the copper. The brazing operation is conducted in the usual manner. The flux consists of a mixture of oxide of copper, iron filings and borax. The exact proportions are not essential. Just what part the iron filings play is not clear. The inventors use a finely divided iron called iron-by-hydrogen. It is a very finely divided metallic iron and may be mixed with the other ingredients nicely.

The cast iron to be brazed is first painted with a strong solution of borax in water and the flux put on. The brazing is then conducted in the usual manner with blowpipe, fire, or other means. The ordinary spelter solder is used for the brazing. By the use of this flux it will be found that the solder penetrates the cast iron quite deeply and so makes a strong joint. Many subsidiary companies are now being licensed to use this process. The Pich process is controlled by New York Brazing Company of New York City.

THE OLD, OLD STORY.

Our British friends appear to be as susceptible to the fascination of a new white metal as we ourselves are. The following statement appeared in an English trade paper: "We have received a sample of a new silver-white alloy which, it is claimed, is a perfect substitute for nickel. It is of good color and takes a high degree of polish. The alloy is called 'Patrick's Metal' and it is claimed that it is harder and tougher than brass, from which it differs in that it does not change its color under heat as the yellow metal will do. It is not affected by sulphur, salt, lime, etc., and will resist the action of most acids. Moreover, it can be cast and rolled and is easily soldered and brazed. It should also secure a place among the pipe-fitters for bar and restaurant work where pipes are in sight, because in tube form it is said to take a good thread." History simply repeats itself.

It is significant that the United States Government should pay royalty to a German subject for a metallurgical process, but such is the case. At the Mint in Philadelphia the Wohlwill process is used for making pure gold. The process is the invention of Emil Wohlwill, of Germany, and to whom the Government is obliged to pay royalty.

CASTING BRITANNIA METAL IN PLASTER MOLDS.

The use of plaster of paris molds for casting metals is becoming more and more extensive and possesses many advantages. In the case of britannia or other soft metals, however, the metal mold has been employed to a great extent for the reason that it has been difficult to use a plaster mold for the purpose. The metal does not appear to run in it in the manner that it should. While the plaster of paris offers many advantages, especially when only a few castings are desired, its use has been retarded on this account.

A method discovered by G. H. Brabrook, of the Reed & Barton Company, of Taunton, Mass., entirely obviates this difficulty and allows the plaster of paris mold to be used with satisfactory results. In casting britannia metal in plaster molds it has been found that the metal will not retain its fluidity so as to fill all parts of the mold, but chills or becomes oxidized or sluggish, so that only the part near the gate is perfect. In many instances articles containing many thin places, such as, for instance, ladles or similar articles of table ware, have been made in whole or in part from sheet metal and stamped or drawn in the press. There are many instances in which the cast article would be cheaper and more quickly made and, at the same time, produced from much harder alloys and, indeed, from those which will not even roll into sheet.

a



It has been found that if the mold be covered with a vegetable-fat acid that the metal will flow into the mold in a satisfactory manner, so that every part is filled with a sharp, clean impression. Although other materials will answer, it has been found that "Japan Wax" is particularly suited for the purpose, for the reason that it contains a large percentage of palmitic acid—a material which seems to be necessary for the proper working of the process—and, at the same time, is quite inexpensive. In the sketch accompanying this article is shown a plaster mold for casting a thin shape in britannia metal. The Japan-Wax is simply applied to the surface of the mold as indicated by *a*. The mold is warmed and the wax applied to it in the melted condition with a brush. Care must be taken not to fill the corners with so much wax that it becomes clogged, but only to saturate the surface of the mold.

It has been found that one coating of wax will answer for the making of several castings, and when this has been exhausted a new coating may be applied. In connection with this process it may be said that the application of the wax may be as readily and advantageously used in the casting of other soft metals as it is in the instance of britannia metal. The wax may likewise be used on dried sand molds for the casting of soft metals and works fully as well as it does in the case of plaster of paris.

The new oxy-acetylene blowpipe has been brought out in France. The flame is formed by the burning of eight parts of acetylene and one part of oxygen. A pressure of a column of 13 feet of water is required in order that the flame may not travel back in the cylinder. The flame is not luminous, and all metals may be readily melted. Even lime and silica are readily melted.

A SIMPLE METHOD OF MAKING CHROMIUM.

The large use of chromium in the steel industry and the comparatively small amount of knowledge that is possessed by the majority of people about this metal renders any new method for its production interesting. A. K. Eaton has discovered a method for producing chromium in the following manner:

A mixture of 131.6 lbs. of sodium bichromate and 143.2 lbs. of zinc sulphate is made and subjected to a red heat to drive off all the sulphuric contained in the zinc sulphate. There is formed by the reaction zinc chromite and sodium sulphate. There is formed by the reaction zinc chromite and sodium sulphate. The latter is removed by boiling water and there is left the zinc chromite in the form of a gray powder. This zinc chromite is mixed with 20 per cent. of its weight of very finely powdered carbon and the mass moistened with molasses and subjected to a strong hydraulic pressure and made into compact cakes.

The cakes are now heated in a furnace until the zinc has been driven off and there results pure chromium in the shape of the cake and in a compact form. The formation of the cakes before heating is quite important, as the zinc is then all volatilized without recourse to acids.

Chromium has not yet found its way into the non-ferrous alloys, but it is believed that sooner or later this metal will play as important part in the copper alloys as it does in the metallurgy of steel.

THE MOLDING OF AMBER.

Metal workers are constantly on the alert to find materials which may be used in connection with the metallic parts of their wares, and all varieties of substances have been used. Amber seems to have been little used for this purpose, although, of course, for certain lines of work like cigar holders, pipe mouth-pieces, etc., it is extensively employed.

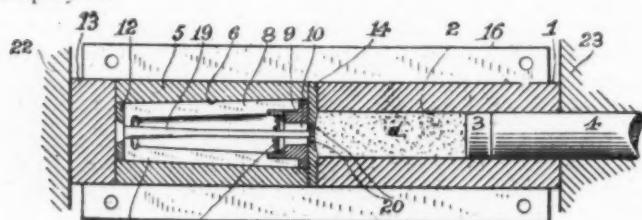


Fig. 1.

Although amber is a non-metallic substance and scarcely comes within the category of the discussion of metallic substances, there seems to be so much field in its use in connection with metals that it is deemed advisable to describe a new method for molding amber which has just been patented by Edward L. Gaylord, of Bridgeport,

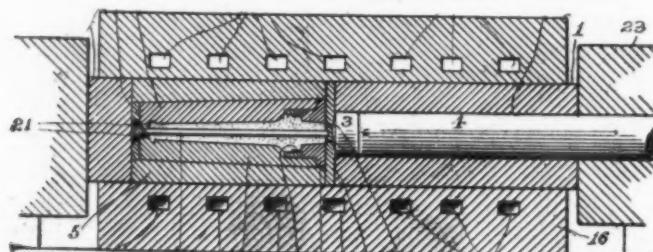


Fig. 2.

Conn. Mr. Gaylord has been working upon this process for many years and has finally accomplished the desired result. Heretofore amber has resisted all attempts to

mold it, but all articles have been cut from the solid mass with the consequent waste. The chips from such a process is what Mr. Gaylord uses.

The principle of Mr. Gaylord's invention consists in forcing the amber into a steel mold under hydraulic pressure and then heating it from 220 to 270 degrees C. The amber then expands and fills all parts of the mold. In Figs. 1 and 2 are shown the method of molding the amber. The amber chips are placed in the front compartment (Fig. 1) and forced under a heat of 190 degrees C. into the mold by means of hydraulic pressure. In this instance the form molded is a pipe stem. The amber fills the mold and after heat has been applied the mold is filled (Fig. 2).

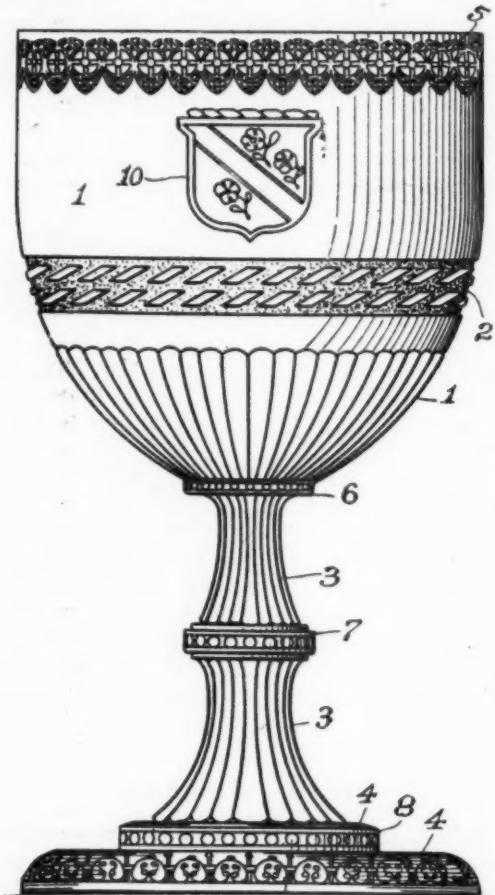


Fig. 3.

When it is desired to embellish the amber with metallic portions the latter are simply inserted in the mold and the amber attaches itself tenaciously to them.

In Fig. 3 is shown a vase molded by this process and embellished with various metal ornaments. These ornaments not only serve to beautify the article, but to protect it from injury as well. It is believed that amber will now enter the arts more extensively than heretofore and particularly for the accompanying of metal wares.

The use of phosphorus in copper alloys is becoming quite extensive, and the true value of the element in certain lines of work should not be underestimated. Phosphor-copper is now a regular article of commerce, and may be used in place of phosphor-tin when it is necessary to add phosphorus without adding tin. The phosphor-copper consists of copper and phosphorus and the best percentage to use is one containing 10 per cent. of phosphorus.

MARBLEIZED SILVER.

A few years ago this finish for silver-plated work made its appearance and was used quite extensively in the finishing of certain classes of work. A bicycle company used it for the frames of the machine which they put upon the market. It was likewise used for various ornamental work of a smaller nature. For some reason the finish has lately fallen into disuse, but as it is a pleasing finish for many classes of work it is believed that a description of the method of making it will be of interest to our readers.

The finish may be produced on solid or plated goods, but is intended primarily for work upon which only a thin film of silver has been deposited. For work of the nature of a bicycle or other large surface it will readily be seen that the amount of silver deposited must necessarily be quite small. There is no metal, gold excepted, which is better suited for the purpose of depositing thin films than silver. The softness and accompanying tenacity of the film render its removal from the base metal a difficult operation. It does not peel like nickel and, therefore, the silver deposit is suited for the purpose.

The principle of the production of marbleized silver is the sprinkling of acids on the surface of the silver and allowing them to spread, by capillary attraction, over sufficient surface to impart the marbleized effect. The acids used are a mixture of nitric and sulphuric. Sulphuric acid, if used alone, will not appreciably affect the silver, while nitric acid, if not mixed with sulphuric, will act on the work with such vigor that the work will be spoiled. If nitric acid is applied to the surface of the silver-plated body, the silver will be removed and a black, unsightly blotch will be produced.

A mixture of the two acids, however, has a very different effect, the nitric acid appearing to aid the sulphuric acid in forming a film of silver sulphate. As this sulphate is only formed on certain areas of surface and as the different parts of the film within these areas are of various shades of color, the completed article has the appearance of marble. Articles treated in this manner differ in appearance just as two pieces of marble differ, and in many instances the marbleized silver cannot be distinguished from real marble. By employing various acids and different combinations varying tints may be produced on the silver. To use this method the following instructions should be carried out:

The article is silver plated in the usual manner in the cyanide silver bath. It is then removed from the bath, washed in water and dipped into a solution containing a solution of carbonate of copper in cyanide of potash solution. The article is now removed, and without washing or rinsing is sprinkled with a mixture of five parts of sulphuric acid and one part of nitric acid, which have been previously mixed together. The article is next washed and placed in a bath containing the following, viz.:

Water	1 gallon.
Carbonate of soda.....	5 ounces.
Carbonate of ammonia.....	5 ounces.
Carbonate of copper.....	5 pennyweights.
Cyanide of potash.....	6 pennyweights.

The solution is used hot and a strong electric current is used. The article is used as the cathode. Copper plates are used as the anodes. The article is removed and washed and then lacquered in order to prevent the spoiling of the marbleizing. Silver is so susceptible to atmospheric influences that this precaution is necessary.

The method given above will produce a brown tint upon the surface of the silver, but if, instead of the mixture of sulphuric and nitric acids one containing sulphuric acid, nitrate of soda and hydrochloric acid is used, an iridescent blue tint may be produced.

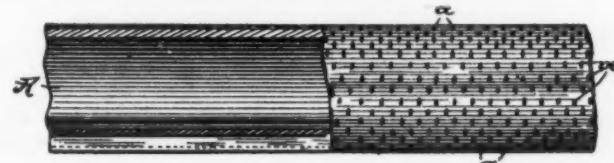
By the use of the following solutions the color may be varied and different effects produced: (a) Conduct the operation as before until the acid has been sprinkled on. Then wash off and dip in a hot solution of potash and water and proceed as before. (b) Instead of using the mixture of acid for sprinkling given, take sulphuric acid five ounces, water three ounces, and nitrate of potash two ounces, and continue as before. (c) Conduct the operation as in the first instance, but instead of the acid mixture given use the following, viz.: Sulphuric acid fifteen parts, nitrate of soda five parts, and muriatic acid one part. Treat as before. (d) Take work directly from silver-plating solution, wash with water and dip on a hot solution of potash. Put on usual acid mixture without washing off the potash; treat as before.

Many shades of color and many beautiful effects may be produced by varying the baths and treatment, and the ones given here are only a few of those which may be produced.

THE NEEDLE FINISH.

This finish is particularly applicable for the finishing of brass or bronze tubing used in the construction of ornamental work such as bedsteads, for the reason that the surface not only is not as susceptible to scratching, but the lacquer adheres more tenaciously than otherwise. A pleasing appearance, unlike the usual finish, is also produced.

The finish is roughly shown, although not accurately, in the sketch, and is made by passing the tubing through rolls provided with numerous needle points or similar projections. Other methods may, of course, be used. The idea,



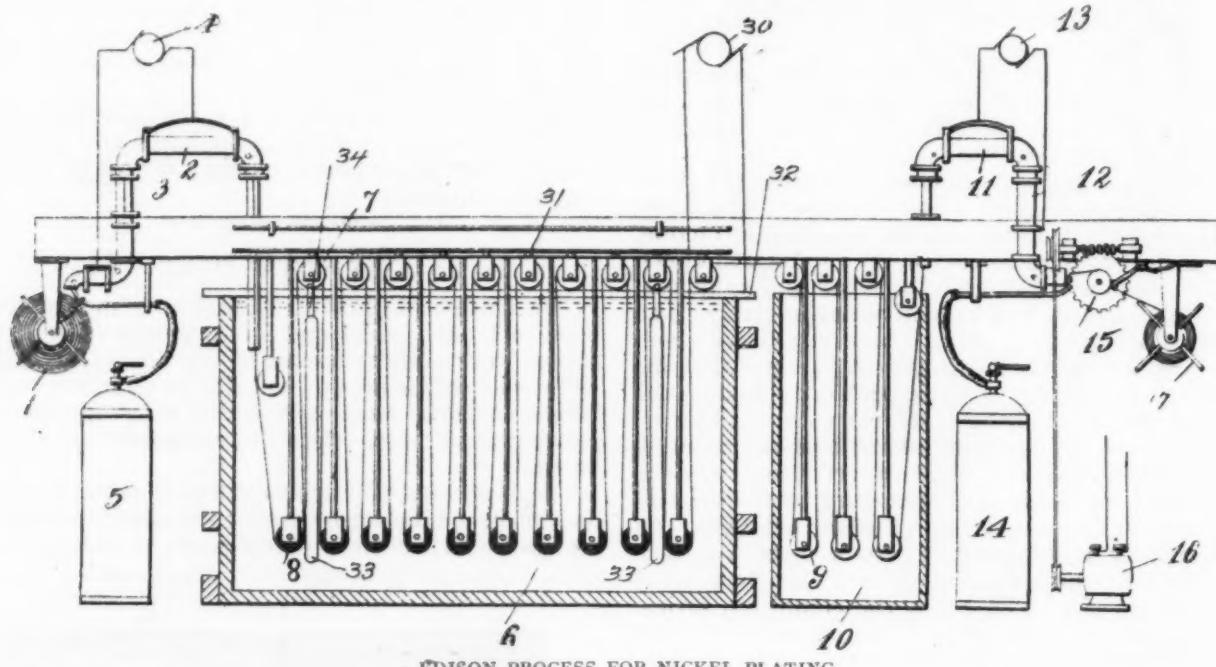
however, is to have the indentations as fine and as near together as possible. Care should be taken to avoid having the indentations coarse and far apart, as they then hold the dirt and do not retain the polish that the fine, close marks do. A series of minute pricks are what should be produced.

Bedstead tubing is made from iron pipe or seamless steel tubing covered with brass or bronze in the form of sheet, and it is obvious that far better results are obtained by producing the needle finish after the tube has been made rather than before the sheet has been applied to the iron or steel.

A very thin coat of silver put on brass by electroplating shows the base metal underneath, and the article has an unpleasant tint, and one which is not desired. As it is often desired in cheap work to plate brass with a very thin coating of silver, it is necessary to prevent the brass from showing through. This obstacle may be overcome by first giving the article a coat of nickel and afterward the required amount of silver. The necessary whiteness will then be produced.

EDISON'S PROCESS FOR NICKEL PLATING.

Some time ago a process for nickel plating discover by Thomas A. Edison was described in THE METAL INDUSTRY. Mr. Edison found that when steel or iron is nickel-plated in the usual manner, so as to obtain a good, even plate, and then heated in an atmosphere of hydrogen gas to a certain temperature that the nickel alloys with the iron and forms a tough, non-corrosive coating so that the sheet metal may be bent, drawn, spun or stamped without any of the difficulties which attend sheet iron or steel which have been only electrolytically treated—that of the nickel peeling off. The nickel-plated sheets made by Edison's method are used in his new lightweight storage battery. Heretofore, the method of carrying out the process was not described, and the following is a description of it:



EDISON PROCESS FOR NICKEL PLATING.

The process is made continuous and steel strips in coils are operated upon. The coil 1, is first passed to a chamber 2, heated to a red heat and through which hydrogen gas from the tanks, is passed. Any oxide on the steel is reduced and the grease or oil burned off. The steel is cooled in the hydrogen gas to avoid oxidation and passed directly into the plating tank 6, and passed over rollers of suitable non-conducting material. The nickel anodes are 33, and are hung as indicated. From this tank the strip is passed directly to the wash tank, as is customary in all plating operations, and the metal carefully rinsed. From the rinse tank the metal is passed to a heating chamber again and heated in hydrogen gas from the tank 14, until the nickel is combined with the steel. From this heating chamber the strip is passed to the reel 7, in a finished condition.

The supply of platinum is obtained almost entirely from the Ural Mountains in Russia. It is a metal for which new uses is constantly being found. Chemical apparatus, acid stills, spark points in automobiles and gas engines, and in all forms of electrical apparatus. The present Russian-Japanese war is beginning to have its effect on the price, and if the war continues for any length of time there is bound to be a continual advance.

BLISTERED GOLD.

This finish for gold jewelry made its appearance upon the market some time ago, but the knowledge of its production has retarded the extended use. The following is the manner of producing it:

The gold, mingled with its alloy in the usual manner, is melted and rolled out into strips or pieces of the proper shape, and then gas or other flame supplied to the gold by means of a common blow-pipe. In order to produce the best result, the extreme point of the flame should alone come in contact with the gold. After applying the flame for a certain length of time, which varies with the degree of heat, and somewhat with the thickness of the metal strip, the gold will begin to blister. A higher degree of heat concen-

trated on a more confined surface is needed to produce blistered gold than to produce what is known as "sweated" gold, and care must be taken not to apply the heat for such a length of time or to such a degree that the gold will be melted. The result of the blistering is that little inequalities, which are mostly porous internally, are formed upon the surface of the gold, probably by reason of the great variance between the temperature of the gold at the point where the flame strikes it and the remainder of the gold. This porosity often extends inward to considerable distance. The flame should be successively applied to all portions of the gold which it is desired to blister. The result is that the gold acquires a very beautiful appearance which, especially in combination with precious stones, is very pleasing to the eye. The appearance somewhat resembles that of gold filings soldered on to a piece of metal. The blistered gold, however, is much more beautiful.

Experience shows the greatest variety in the shape and form of the irregularities produced by the blistering, and it is almost impossible to make two pieces exactly alike. Moreover, the blistered gold is smooth, whereas the soldered gold filings are rough, which, in articles of jewelry, like sleeve buttons, for instance, is very objectionable. The blistered gold is also much more durable. Soldered filings cannot be shaped after

they are soldered, while the blistered gold may be shaped after it has been blistered.

Filing the gold will produce almost the same result; but the roughness thereby obtained is objectionable, and it is more expensive to produce and there is less variety in its appearance. The effect produced is much better and more pleasing in gold with a copper alloy than in gold with silver alloy. A good effect is produced in each kind of alloy where the gold is from 14 to 16 carats of fineness.

When forming an article with a hollow curved part it is necessary to support the underside of the blistered gold with ocher or plaster of paris mixed with water, which may be removed after the work has cooled. The agency of the ocher or plaster of paris is to support the gold while being heated and thus preventing its losing its shape.

A CONDENSER TUBE LAWSUIT.

That all nations have equally unsatisfactory results from brass condenser tubing has been demonstrated. It has been shown to be the "nature of the beast" rather than the fault of the maker. The following will be of interest as showing that there are yet difficulties being encountered. Alexander Macpherson & Co., of Greenock, Scotland, sold the shipbuilding firm of John Williamson, of Great Clyde Street, Glasgow, a lot of condenser tubes which were put in the condensers in the usual manner. The tubes gave way in about three months after use. The tubes were made by The Broughton Copper Co., the well known English brass and copper concern, and the defendants were the jobbers through which the tubes were sold (Alexander Macpherson & Co.). The suit was brought for \$5,500, and damages were awarded the plaintiff for \$1,250.

The case was tried in a lower court and the defendant won, but in the higher court the judgment was reversed with the above result. The decision of the lower court who found for the tube-maker is interesting. His charge to the court was, viz.: The agents of the tube-makers communicated to the plaintiff all they knew about the tubes at the time of sale, and this information was given three weeks before the order was placed. The tubes, to be sure, gave away in about three weeks after being in use, but from the evidence introduced it was learned that condenser tubes would and did fail while in use for even a much shorter time than three weeks and that the cause of such failures is unknown. The cause of the failure of the tubes in question might, therefore, be regarded as one of these abnormal conditions and certainly not to be accounted for by any defect or deficiency in the material from which they were made, or any fault committed in their manufacture.

The defendants discovered that the tubes were made at The Broughton Copper Company's mill by a new process for making seamless tubing, but which was found to be unsatisfactory after the tubes in question were made and then abandoned. This discovery appeared to militate against the defendant in the higher court and with the result given. So many similar cases have occurred within our own domains that this particular case is interesting.

Tinning condenser tubes is a practice of doubtful value. Although much less done than formerly, there are still many tinned brass condenser tubes sold. The tin quickly wears away while in use, and it has never been shown that a tinned tube has any longer life than an untinned one.

THE PATTERSON BELT POLISHING MACHINE.

Every plating establishment, as well as shops which do polishing without plating, requires a strapping or belt polishing machine. It is the only machine which can be used on certain forms of work. To be sure it is analogous to the emery or other wheel, but the shape of the belt allows it to be very advantageously used on irregular work which cannot be manipulated on the wheel. The strapping belt consists of a canvas or other flexible belt (leather or silk is also used) and coated with an abrasive of some kind.

In order to obtain good results with the strapping belt it is quite important that suitable devices should be used for running it. A frame or machine which does not work well or is not readily adjustable fails to give the real efficiency of the belt. The Miami Valley Machine Tool Company of Dayton, Ohio, are putting upon the market a new form of belt polishing machine, which they call "The Patterson Belt Polishing machine" and which has many novel features.



In the first place, the main part of the machine, as shown in the cut, may be used for an emery grinder for two wheels or may be used as a part of the belt polishing apparatus. The second part of the appliance consists of a wheel upon a stand and provided with a lever for tightening or loosening the belt. This lever is controlled with the foot, and the belt may be tightened or loosened while the machine is in motion and so adjusted to suit any individual class of work. Such an appliance is very reliable and renders the machine quite flexible. The machine is furnished with self-oiling devices, and those who use strapping belts should not fail to investigate the merits of this machine.

Aluminum is peculiarly suited for use in the rubber industry on account of its not being acted upon by sulphur or its compounds. If aluminum castings are to be used in the rubber industry the alloying metal should be zinc and not copper. The latter is readily acted upon by sulphur.

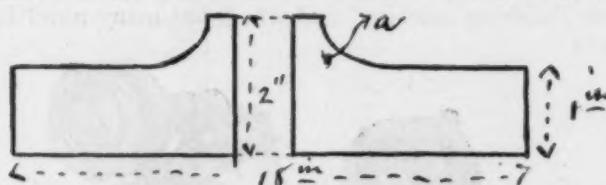
In the Province of Lower Burma, India, near the Siamese frontier, tin deposits have recently been discovered. The tin ore is said to be of as high a quality as that mined in the Straits Settlements.

CORRESPONDENCE DEPARTMENT

In this Department we will answer questions relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A foundryman says that he has had difficulty in casting valve bonnets of 88-10-2 mixture. The castings nearly all leak at *a* when a water pressure of 400 lbs. per sq. inch is applied.

A.—It is impossible to tell exactly what is the matter with your castings without seeing them, but it is one of two things, viz.: Dirt or dross which has entered the casting or slight shrinkage or segregation in the part which leaks. If it is the dross you can avoid it by the use of the skimgate described in THE METAL INDUSTRY, and if it is segregation or shrinkage, the use of a riser over the part marked *a* may be necessary. It is quite



probable that the thin portion has drawn from the thick leaving the slight shrinkage at the fillet. This may be overcome by the use of a suitable riser—one of good size—placed as near as possible to the difficulty. If the leakage always occurs in the same spot it indicates that it is not due to dross, as it is quite unlikely that this material would lodge in the same place continually. Try the riser.

Q.—A plater says that he is troubled with a brass plating solution. The work after it has been plated and lacquered soon stains all over the work.

A.—This difficulty is apparently caused by not carefully rinsing the work after it has been dipped. Cast iron is a porous metal and absorbs the solution in which it is dipped to a much greater degree than brass or steel. Small pit or pin holes act as cavities for the acid or alkali and unless carefully rinsed, these hold the solution tenaciously. Poor grades of lacquer often stain brass work, and we would advise you to try another brand if there is reason to suspect it.

Q.—A chain maker desires a method of coloring chains used on ladies' cloaks and furs in place of clasp.

A.—The chains are made of brass and the finish is produced by liver of sulphur. In order to obtain the proper degree of color, however, it is first necessary to copper plate the chain—with just a flask of copper—and then oxidize in the following solution: Water, 1 gallon; liver of sulphur, 2 ounces. Use cold. If the solution is too strong, the black coat will rub off. Often oxidized and dried the portions which are desired to show bright are buffed off carefully so that the black color is removed and the copper shows underneath.

Q.—A plater has a number of britannia metal coffee and tea pots to plate and desired to know the best method of plating them. He is desirous of preventing the plating from stripping when the articles are heated when in use.

A.—Britannia metal is much more difficult to plate than brass or copper and it is usual to transfer the article directly from the potash bath to the plating solution without rinsing. As potash attacks the britannia metal slightly a good surface is left for the plate to deposit upon. If you are careful with your cleaning, the plate will adhere well.

Q.—A car box maker asks us for information about the separation of bronze chips and those of babbitt metal. The chips come from the car shops and are generally filled with more or less of the babbitt metal. It is not advisable to put them into car boxes again on account of the antimony which the babbitt metal contains.

A.—The method of separating the babbitt metal and bronze is as follows: In railroad work the babbitt metal used is a composition which consists principally of lead and is, therefore, very much heavier than bronze. A bath of melted babbitt metal is prepared, either in a crucible or iron kettle, and the mixture of bronze and babbitt metal stirred in. The babbitt metal is dissolved and the bronze floats to the top and may be skimmed off.

Q.—A metal worker desires a solution to be used on iron for the purpose of preventing it from rusting when exposed to the weather.

A.—It is impossible to give you complete information on this subject as we do not know in what state your iron is. Of course for rough ornamental iron work a coat of good lead paint of suitable color is the best. If bright iron work a coat of transparent lacquer of a high quality will be found suitable and efficacious. You will find the names of the lacquer makers in our advertising columns, and if you inform them that you desire the lacquer for the protection of iron they will give you the proper quality. Bright iron may be preserved for an indefinite period by immersing it in lime water. Of course the iron must be continually left in the solution and not removed. We have seen iron remain perfectly bright for a period of ten years by keeping it in this solution. Other alkaline solutions, such as salsoda or caustic potash, will answer in the same manner.

Q.—A subscriber desires a mixture which will give a tensile strength of 150,000 lbs. per sq. in. castings and that will flow readily and give clean castings. Also what flux to use for making it and whether the alloy may be melted under the blowpipe.

A.—There is no metal except steel which will give you the tensile strength that you desire. We have been able to obtain a tensile strength of nearly 100,000 lbs. on an alloy of Copper, 63.33 per cent.; Nickel, 33.33 per cent., and Aluminum, 3.34 per cent. This alloy, as far as known, is the strongest copper alloy and can be made by melting the copper and nickel together and adding the aluminum. We have never found that a tensile strength higher than this can be obtained on any alloy of copper or nickel. This alloy may be melted under the blowpipe but cannot be used for solder on account of the aluminum which it contains. See THE METAL INDUSTRY, March, 1904, for a full description of this alloy.

Q.—A correspondent would like to know how to plate on German silver, and also what makes German silver, which has been spun, crack on annealing.

A.—Plating on German silver is one of the simplest operations and is done in the same manner as on any other metal. We can scarcely give you information about plating in general, but if you can plate brass or copper you will have no trouble with the German silver. Your trouble with the metal cracking when annealed is caused by a phenomenon called "fire-cracks," the real cause of

which is not understood. It may be obviated by hammering the metal with a mallet before annealing. See article on Metal Spinning, THE METAL INDUSTRY, October, 1903, in which the method used by spinners for avoiding fire-cracks is fully described.

CRUCIBLE SIZES.

Apropos of our recent suggestions that the crucible makers get together and establish a uniform schedule for crucible sizes we take pleasure in publishing the following remarks made by a foreman of one of the largest brass foundries in the South.

"In your last issue there appeared a suggestion that the crucible makers have a convention to adjust the sizes of crucibles. In my opinion such a convention is very much needed as no two makers have pots of the same dimensions. A case in point now exists in my own foundry at the present moment. I use quite a number of No. 300 pots and obtain them from one of the best makers. Some time ago I had the opportunity to buy some No. 300 pots from a defunct foundry, and at a much cheaper price than what I am now paying. After purchasing the crucibles, however, I found that the tongs would not fit by a long way. I found that in every case where the maker of the pots is changed that the shape of the tongs must likewise be altered. I hope that the convention may materialize."

We regret to report the death of Rear-Admiral H. C. Taylor, Chief of the Bureau of Navigation of the United States Navy. Admiral Taylor became famous in the Spanish-American War as captain of the battleship "Indiana." He was interested in the use of the non-ferrous metals for the Navy, and a few years ago advocated the establishment of a Bureau of Metallic Alloys by the Navy Department. He was also interested in a factory manufacturing aluminum goods.

John S. Dickerson, formerly head of the metal firm of Dickerson, Van Dusen & Co., of New York, died during the past month at the age of 76.

We have received from the National Society of Amalgamated Brass Workers of England a copy of the 32nd Annual Report and financial statement, which sets forth the good work accomplished by this society during the past year.

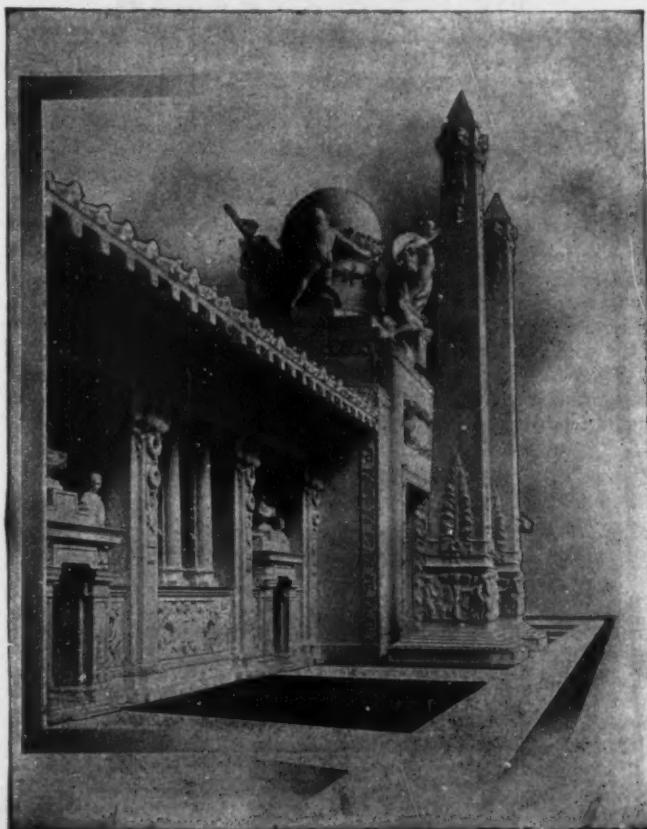
An International Electrical Congress under the auspices of the American Institute of Electrical Engineers will convene at St. Louis on Monday, September 12, 1904.

Gold to the value of \$61,454,439 was mined in the Transvaal during the year 1903. The silver production for the same period was valued at \$178,820.

An attractive pamphlet has just been issued by the Falcon Bronze Company, of Youngstown, Ohio, which is illustrated with a cut of their foundry and of their various products, which include a variety of bearings, pickling cradle tops and bottoms, cradle pins and cradle fittings. These cradles are made of their acid metal. After a number of years of experimenting the company have developed a method of melting brass and bronze in an ordinary cupola.

METALLURGY AT ST. LOUIS.

The accompanying illustration shows the Mines and Metallurgy Building at the World's Fair, St. Louis, and in which is housed the special exhibits of non-ferrous metallurgy. The building is of the same size as that of the Liberal Arts, covering a space of 750 x 525 feet. We are informed that most of the exhibits relate to mining but there are several important displays of metal work, particularly in aluminum, zinc and nickel. The brass and copper industry is not extensively represented, while gold, silver, tin and lead are shown principally in the mining exhibits. Of course in a number of the other buildings may be seen fine specimens of metal work in all of the non-ferrous metals which are a part of the displays of fine goods, machinery and general metal ware. Later we shall have more to say about the individual exhibits.



MINES AND METALLURGY BUILDING.

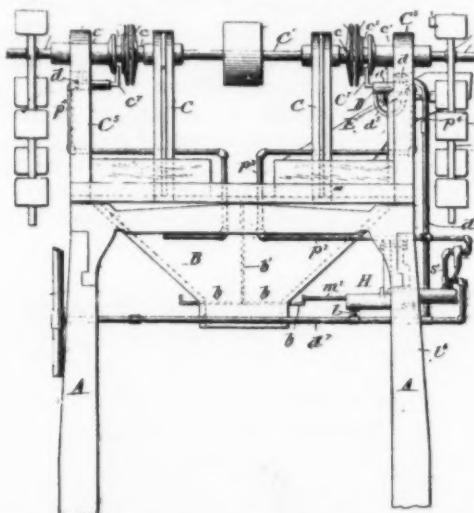
The St. Louis Exposition is the largest of all Expositions, covering 1,240 acres and all of the buildings and exhibits are on the same mammoth scale. Not only are the products of the United States in art, industry, and science liberally represented, but the foreign governments are likewise most liberal in their representation, Germany and France spending over \$1,000,000 each. The United States Government is worthily represented, and its Philippine exhibit is the largest single exhibit at the Louisiana Purchase Exposition.

The Mexican Permanent Exposition Company has been organized by a number of citizens of Mexico for the purpose of holding a permanent exposition in Mexico City of such products of other countries that are best adapted to Mexican uses.

PATENTS

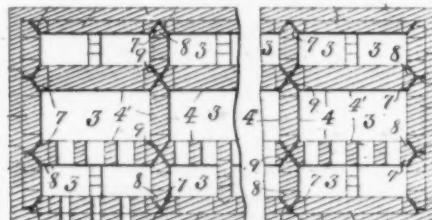
A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

758,313, April 26, 1904. MOLDING MACHINE. Frederick W. Hall, Camden, N. J., assignor of one-half to J. W. Paxson Company, Philadelphia, Pa., a corporation of Pennsylvania. In a molding-machine, the combination of a hopper or receptacle, a



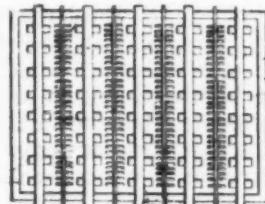
conveyor for delivering molding material thereto, means for operating said conveyor, fluid-operated devices for rendering said means inoperative when a desired quantity of molding material has been delivered to the hopper or receptacle and means carried by the conveyor for controlling said fluid-operated devices.

758,852. May 3, 1904. JOINT FOR BRICKWORK OF FURNACES, ETC.—Frank C. Roberts, Philadelphia, Pa. In a furnace or other structure subjected to high temperatures, a wall containing bricks,



and combustible fillers between the adjacent ends of the bricks which form the joints, the spaces occupied by the fillers taking up the longitudinal expansion of the wall.

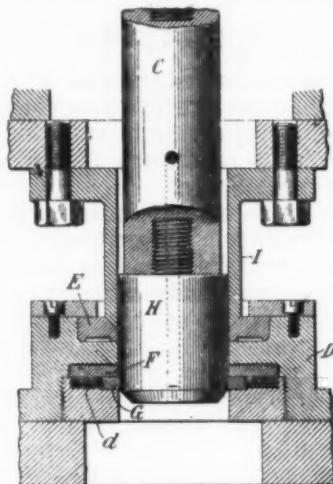
760,023, May 17, 1904. APPARATUS FOR THE ELECTROLYTIC REFINING OF METALS. Alfred Schwarz, New York, N. Y., assignor to the General Metals Refining Company, New York, N. Y., a corporation of Delaware. In an electrolytic apparatus for the refining of metals, the combination of a cathode of large surface for



a given tank capacity consisting of a plurality of substantially parallel plates, and a soluble anode, the said cathode-plates being spaced apart and arranged at an angle to the face of the anode so that there will be a free circulation of the solution whereby the metal will be deposited on both sides of the cathode-plates.

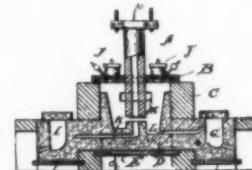
760,921, May 24, 1904. DRAWING-PRESS. John J. Rigby, Brooklyn, N. Y., assignor to E. W. Bliss Company, Brooklyn, N. Y. In a drawing-press, the combination of a plunger, a reducing-die, a burnishing-die, and a bed having a wall for rigidly supporting said reducing-die, said burnishing-die being formed of

thin metal so as to be capable of slight distortion during the drawing operation, and being mounted beneath said wall in such a



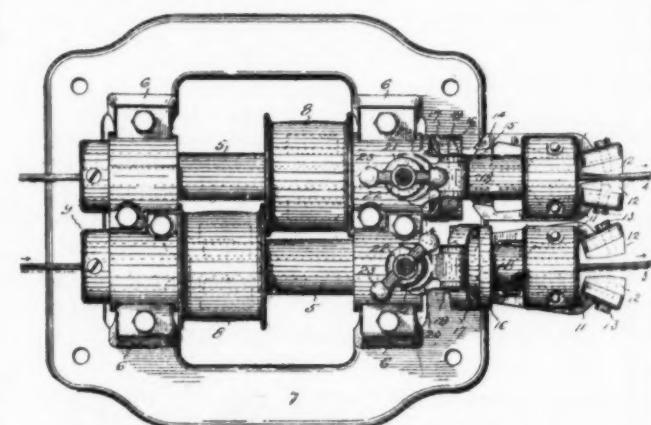
manner as to leave a space between the upper face of the die and the lower face of the wall.

760,554, May 24, 1904. MANUFACTURE OF SULPHIDE OF ALUMINUM AND ALLOYS OF ALUMINUM. Miyagoro Onda, Nagoya, Japan. The process of manufacturing sulphide of aluminum together with an alloy of aluminum and other metal or metals contained in the metallic sulphide used in the process, in one opera-



tion, which consists in subjecting a compound consisting of oxide of aluminum or other ores containing it, together with carbonaceous materials and a metallic sulphide to a high temperature in a suitable furnace.

761,634, May 31, 1904. MACHINE FOR POLISHING INSULATED WIRE. Oliver T. Hungerford and Charles F. Kilgore, Belleville, N. J., assignors to the Hungerford Electric and Manufacturing Company, Belleville, N. J., a corporation of West Virginia. A polishing-machine having a rotary tubular spindle, levers carried



by the spindle, polishing-blocks adjustably attached to the levers, a pulley loosely mounted upon the spindle, keys movable longitudinally of the spindle and adapted to oscillate the levers and to lock and unlock the pulley and the spindle, an angle-lever adapted to move the keys, and a handle adapted to oscillate the angle-lever substantially as specified.

TRADE NEWS

When You Have Any Trade News of Interest Send It to THE METAL INDUSTRY, 61 Beekman Street, New York.

Additions are being put on two of the buildings of the Chapman Valve Company at Indian Orchard, Mass.

The White Metal Rolling Mill of John Toothill, of 210 Canal street, New York, manufactures britannia metal for platers' use.

Frederick J. Wooster, for eighteen years superintendent of the Waterbury Brass Company, has resigned on account of ill health.

A fireproof addition to its rolling mill, 80 x 150 feet, is being built by the Coe Brass Manufacturing Company, of Torrington, Conn.

In the near future the Stewart Gas Range Company, of Newark, N. J., expect to build a foundry for the making of their own castings.

The Crowe Metal Manufacturing Company, of Chicago, Ill., are sending out an illustrated catalogue about their embossed name-plates.

The Globe Brass Works, of Detroit, Mich., issue in their catalogue C some information that is of interest to plumbers and steam fitters.

In order that they may enlarge their plant, the directors of the Acorn Brass Manufacturing Company, Chicago, Ill., have obtained a loan of \$25,000.

The Randolph-Clowes Company, Waterbury, Conn., expect to make some changes in their power plant, but have not as yet decided what the changes will be.

Although the Bristol Trunk Hardware Company, of Bristol, Conn., is less than a year old, they have issued their first catalogue, containing a very complete list of trunk hardware.

Dominick & Haff, silversmiths, are now located at their fine new six-story building, 539 West Twenty-third street, New York. They manufacture sterling silver goods for the trade only.

H. J. Hawkins, an electro-plater of experience, has established an office at 373 Dearborn street, Chicago, Ill., where he is prepared to give expert advice on the subject of electro-plating.

A No. 9 rolling mill has been shipped to China by Blake & Johnson, of Waterbury, Conn. The mill is to be used for rolling coin stock in one of the mints of the Chinese Government.

The large addition to the Spargo Wire Works, of Rome, N. Y., has been finished and is in operation. The works now manufacture brass wire as well as copper, and are running day and night.

The Angola Engine and Foundry Company, of Angola, Ind., have started their foundry. They make castings in brass and copper, and also gas and gasoline engines from 1½ to 15 horse power.

The Ross-Tacony Crucible Company, of Tacony, a suburb of Philadelphia, advertise to manufacture the best crucibles for melting brass and steel. Their prices are moderate, considering quality.

The firm of H. Kramer & Son, metal smelters, refiners and dealers, Chicago, Ill., who were established in 1888, have incorporated with a paid up capital stock of \$35,000, under the name of H. Kramer & Co.

A contract has been let by the Yale & Towne Manufacturing

Company for an additional building, 57 x 75 feet. The company will also enlarge their cabinet lock department by the erection of another building.

M. W. Carr & Co., jewelry manufacturers, West Somerville, Mass., had a small fire in their celluloid department, which is located in a separate building from their regular factory and which is now being rebuilt.

The New London Motor Company, New London, Conn., have incorporated under Connecticut laws and established works, where they will build and install marine motors and do marine and automobile repairing.

One of the sections for the large bronze tablets for the new Williamsburg Bridge, New York, was successfully cast on January 15th at the bronze foundry of the William H. Jackson Company, New York City.

The Ellwood Ivins' Tube Works, Oak Lane Station, Philadelphia, Pa., report increasing orders for their seamless tubing in steel, brass and copper. They manufacture the tubing from 1/64 to 2 inches in diameter.

We have received from the Frankfort Brass Works, Frankfort, Ind., their catalogue of plumbers' brass work, of which they make a great variety. The catalogue is fully illustrated and gives prices of all their goods.

The courts have appointed the Guarantee Title & Trust Company receivers for the Pittsburg Cornice & Skylight Company in the equity proceedings instituted by C. G. Hussey & Co., Follansbee Brothers Company and others.

The W. H. Sweeney Manufacturing Company, of Brooklyn, N. Y., makers of nickelware, report a larger sale of goods this year than for the same period of 1903. The company have planned a large addition to their factory.

At some future date it is the intention of the Horace Remington & Son Company, Providence, R. I., to put up a new building, and they have already acquired the ground for this purpose. The company are gold and silver refiners.

We have received word from the Pope Clay Products Company, recently incorporated in one of the southern States, that the company does not at the present time contemplate the sale or production of aluminum, as has been published.

The Sterling Emery Wheel Company, of Tiffin, Ohio, have an exhibit at the World's Fair, St. Louis, in the Machinery Building, Aisle C, and invite their friends who visit the Fair to have their mail addressed in care of the company.

The Otto Gas Engine Works, of Philadelphia, Pa., have bought 57 acres of land in Wilmington, Del., along the Christiana River and expect to soon begin building operations. When the new works are in full operation 2,000 men will be employed.

The McNab & Harlin Manufacturing Company, 56-60 John street, New York, with a large factory at Paterson, N. J., are also occupying the first floor and basement of an adjoining building. This extra room gives the company much needed facilities.

A company is being organized at Berea, Ohio, for the establishment of a factory for the manufacture of a device for plating soft metals. The inventor is N. C. Clewell, of Canton, Ohio, and A. H. Wyatt, Park Building, Cleveland, is promoting the industry.

John A. Roebling's Sons Company, of Trenton, N. J., have bought a tract of 200 acres near Florence, N. J., where they will put up a large plant, to be operated in connection with their Trenton works. This year they will build a rolling mill on their new property.

On account of their increasing business, the Brainard & Wilson Company, Danbury, Conn., are erecting a three-story addition to their factory, 30x40 feet, to be used by their plating, casting and buffing departments. The company manufacture gold and silver plated novelties.

The Diamond Machine Company, of Providence, R. I., builders of grinding and polishing machinery, report that their shops will be closed from August 20 to 29 for stock-taking and repairing. The office will be open for business, and orders for catalogue goods will be filled as usual.

Watson, Frye & Co., brass founders and machinists, of Bath, Me., are to erect an addition to their foundry 60x70 feet. The firm have recently acquired the rights for Bath and vicinity of the use of the Ferro-fix process for brazing iron. They have arranged their plant that they may do this class of work.

Michael Hayman & Co., smelters of metal, at Buffalo, N. Y., expect to move into their new plant this fall, which is located on the line of the New York Central Railroad on the outskirts of the city. Their new works will produce a carload of metal a day. They buy residues from brass founders and platers, using them in the reduction of ores.

Mr. R. S. Woodruff has been appointed permanent receiver of the Housatonic Manufacturing Company, of New Haven, Conn., and the business will be continued under his direction. Over 200 hands are employed at the present time, and the company is doing a considerable business in tinned spoons, knives and forks, gas and electric holders, screw caps and other special goods.

The Cassady-Fairbank Manufacturing Company, Chicago, Ill., have been incorporated to manufacture brass and steel stampings, hardware specialties, automatic screw work and automatic machine work. The officers are: H. J. Cassady, president; Dexter Fairbank, secretary and treasurer. The corporation have bought the Federal Manufacturing Company's factory, located at 6104 La Salle street.

The Standard Specialty and Tube Company have been organized at New Brighton, Pa., and are making collapsible tubes and metal specialties. The tubes are used for holding cement, ink paste, etc., and are made in block tin and of a tin-coated metal which they call "Standard Metal." The company have a New York office at 102 Chambers street in charge of W. F. Catterfield.

The Bausch & Lomb Optical Company, of Rochester, N. Y., have let the contracts for two brick buildings of mill construction—one 42 x 424, four stories, the other 40 x 75, one story. All will be equipped with automatic sprinkler system supplied from a reservoir containing 150,000 gallons. There will be three electric elevators, and the buildings will be heated by exhaust steam with three large fans.

Among the recent sales of the Kenworthy Engineering and Construction Company, of Waterbury, Conn., are rolling mill power transmission machinery to the Cheshire Brass Company, West Cheshire, Conn.; a special annealing furnace for copper work to Eugene P. Phillips Electrical Works, Montreal, Canada, and a tempering furnace outfit to the Bantam Manufacturing Company, Bantam, Conn.

The Union Cutlery & Hardware Company, Unionville, Conn., recently incorporated, have bought the cutlery department of the Upson Nut Company and are getting into shape to manufacture nickel knives and forks. They also manufacture tin-plated knives,

forks, tea and tablespoons. H. C. Hart, for 28 years identified with the cutlery shop of the Upson Company, is president of the new company and will have a general oversight of its affairs.

The New York Brazing Company, New York, have been organized to take over the business of the American Brazing Company, New York, and to handle their territory exclusively in accordance with their rights for the use of Ferrofix in brazing castings. It is the intention of the company to enlarge their plant at 329 West Twelfth street. The company will be in a position to braze brass, bronze and copper as well as steel and iron.

The Homer D. Bronson Company, a Connecticut corporation, with \$30,000 capital, located at Beacon Falls, Conn., are adding one story to one of their buildings. It will be 28 x 96, and will be occupied as a buffing and polishing department. The company are large manufacturers of piano hinges and patented piano and desk hardware. They also make a line of electro-bronze art work for decorations in low relief of special designs to meet any style, shape and size.

The Diebold Safe and Lock Company, of Canton, Ohio, have been making a number of improvements in their plant, including the building of a brass foundry, 26 x 40 feet, and a blacksmith and forging shop, 90 x 218 feet. They have equipped their plant with a Hilles & Jones roll, a C. & G. Cooper 500 H. P. engine and a battery of Babcock & Wilcox boilers. They have also built a 125-foot smokestack, and have a plating establishment in connection with their works.

The National Sheet Metal Company, of Peru, Ill., have decided to increase their capital stock from \$35,000 to \$60,000. They state that they have the finest plating plant in the world, plating the widest and longest sheets. They have in their employ Mr. Henry Schuessler, the originator of the company's method of plating metals, and he has improved upon the process as used in Europe. The company manufacture plated sheet metals and sell them under various trade names, such as "nickeltin," "brassttin," "coppertin," "bronzetin."

Owing to the steady increase of their business, the Wolverine Brass Works, of Grand Rapids, Mich., are preparing to erect new buildings. The Wolverine Brass Works were founded in 1896 by L. A. Cornelius, and since the establishment the works have grown to such an extent that they are now an incorporated company, with \$225,000 capital; L. A. Cornelius, president, and H. H. Cornelius, secretary and treasurer. At present 100 men are employed, which will be increased to 150 when the addition to the works is completed.

The Riverside Metal Refining Company have been incorporated under the laws of Pennsylvania with a capital stock of \$25,000. The company succeeds the Riverside Manufacturing & Supply Company, of Connellsville, Pa., and their plant has been remodeled and enlarged for the smelting, refining and manufacture of copper, brass, solder, babbitt, spelter, terne and tuyere metals, phosphor bronze and special alloys. The officers are E. T. Norton, president; William G. Marqua, secretary; John L. Gans, treasurer, and T. E. McDermott, superintendent.

We have received from the Aluminum Manufacturing Company, Two Rivers, Wis., samples of their work in medals and trays for the St. Louis Fair. The medals contain the cuts of the World's Fair buildings and are fine specimens of die work. They are placed in a neat alumigum box, on which is stamped a cut of Jefferson and the territory that he purchased. The tray is elaborately embossed and also contains an embossed cut of the Fair buildings. The trays can have an advertisement stamped on the top and bottom, and would then serve as good advertising novelties. The Aluminum Manufacturing Company report that they have had a very good business during the past year.

Metal Prices, August 3, 1904

METALS

	Price per lb.
TIN—Duty Free.	
Straits of Malacca	27.25
COPPER, PIG, BAR AND INGOT AND OLD COPPER—	
Duty Free. Manufactured 2½c. per lb.	
Lake	12.75
Electrolytic	12.65
Casting	12.50
SPELTER—Duty 1c. per lb.	
Western	5.00
LEAD—Duty Pigs, Bars and Old 2½c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.25
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	7.25
Halletts	7.00
Other	6.25
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
BISMUTH—Duty Free	\$1.50 to \$2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
SILVER—Duty Free—Commercial Bars	\$0.58½
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask.	45.00

Zinc—Duty, Sheet, 2c. per lb.; 600-lb. casks, 6.75c. per lb., open, 7.25c. per lb.	
Tobin Bronze—Rods, Unfinished, 19c.	
Tobin Bronze—Rods, Finished, 20c.	

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent.	19c.
5 per cent.	19½c.
7½ per cent.	20½c.
10 per cent.	21½c.
Manganese Bronze, Ingots	16½c.
Phosphor Bronze, Ingots	15 to 18c.
Silicon-Copper, Ingots	34 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	11.10c.	11.75c.
Copper Wire	11.50c.	11.25c.
Light Copper	9.50c.	10.50c.
Heavy Mach. Comp.	9.50c.	10.75c.
Heavy Brass	7.25c.	8.00c.
Light Brass	5.50c.	6.00c.
No. 1 Yellow Brass Turnings	7.25c.	8.00c.
No. 1 Comp. Turnings	8.00c.	9.00c.
Heavy Lead	3.80c.	4.00c.
Zinc Scrap	3.50c.	4.00c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	16.00c.	20.00c.
Old Nickel	15.00c.	25.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.	96oz. & over	64oz. to 75 lb.	32oz. to 96 lb.	24oz. to 115 lb.	16oz. to 150 lb.	14oz. and heavier
	sheet	sheet	sheet	sheet	sheet	sheet
Not longer than 72 ins.	18	19	19	19	19	20
Not wider than 30 ins.	18	19	19	19	19	20
Longer than 72 ins.	18	19	19	19	19	21
Not longer than 96 ins.	18	19	19	19	19	21
Longer than 96 ins.	18	19	19	19	19	21
Not longer than 120 ins.	18	19	19	20	21	
Longer than 120 ins.	18	19	19	20	21	
Not longer than 72 ins.	18	19	19	20	21	23
Longer than 72 ins.	18	19	19	20	22	24
Not longer than 96 ins.	18	19	19	20	21	23
Longer than 96 ins.	18	19	19	20	21	27
Not longer than 120 ins.	18	19	20	22	25	
Longer than 120 ins.	18	19	20	22	25	
Not longer than 72 ins.	18	19	19	20	22	25
Longer than 72 ins.	18	19	19	21	23	28
Not longer than 96 ins.	18	19	20	22	25	
Longer than 96 ins.	18	19	20	22	25	
Not longer than 120 ins.	18	19	21	23	27	
Not longer than 96 ins.	18	19	20	22	27	
Longer than 96 ins.	18	19	21	24	29	
Longer than 120 ins.	19	20	22	27		
Not longer than 96 ins.	19	20	22	25		
Longer than 96 ins.	20	21	23	26		
Longer than 120 ins.	21	22	24	28		
Not longer than 132 ins.	22	23	25			
Longer than 132 ins.	23	24	27			

Rolled Round Copper, ¾ inch diameter or over, 21 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in.
All columns except the first are for Flat Rolled Sheets.

nds.
list.
e for

de
eter
ches.
1.4
5.16
.38
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3.4
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0.00